WHAT IS CLAIMED:

1. A process module for transport-polymerization ("TP") of a precursor comprising:

(a) a material delivery subsystem adapted to deliver the precursor to a TP reactor;

(b) the TP reactor adapted to receive the precursor and to generate an intermediate;

(c) a deposition chamber designed to produce a polymer film onto a substrate under a vacuum; and

(d) one or more substrate pre-/post-treatment chambers designed to remove contamination from the substrate and to stabilize the polymer film on the substrate under the vacuum.

2. The process modules of claim 1, further comprising a pump cold-trap in fluid communication with the deposition chamber to prevent organic residuals from passing from the deposition chamber into a pump system.

3. The process module of claim 2, wherein the cold trap is at a temperature below -50°C during the precursor deposition.

4. The process modules of claim 1, further comprising a pump system in fluid communication with a pump cold-trap to provide the vacuum for the deposition chamber.

5. The process modules of claim 1, further comprising a reactor cleaning subsystem mounted to the TP reactor to purge the reactor of organic residues.

6. The process module of claim 1, further comprising a TP trap, interposing the TP reactor and the deposition chamber, and adapted to confine undesirable chemicals generated in the TP reactor.

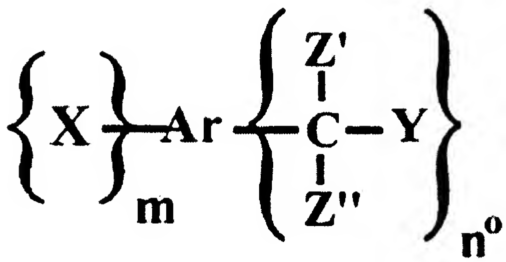
7. The process module of claim 6, wherein the TP Trap contains porous quartz and is maintains a temperature that is at least 10°C higher than a ceiling temperature ("T_{cl}") of reactive intermediates that are generated from the TP Reactor.

8. The process module of claim 6, wherein the TP Trap comprises reactive metal turnings that are kept at a temperature ranging from 200°C to 450°C.

9. The process module of claim 6, wherein the TP Trap comprises reactive metal turnings that are kept at a temperature ranging from 300°C to 350°C.

10. The process module of claim 9, wherein the reactive metal turnings are copper or zinc.

11. The process modules of claim 1, wherein the precursor has the following general chemical structure:



(VI)

wherein, n° or m are individually zero or an integer, and (n° + m) comprises an integer of at least 2 but no more than a total number of sp^2C-X substitution on the aromatic-group-moiety ("AR");

Ar is an aromatic or a fluorinated-aromatic group moiety;

Z' and Z" are similar or different, and individually a hydrogen, a fluorine, an alkyl group, a fluorinated alkyl group, a phenyl group or a fluorinated phenyl group;

X is a leaving group, and individually a -COOH, -I, $-NR_2$, $-N^+R_3$, -SR, $-SO_2R$, wherein R is an alkyl, a fluorinated alkyl, aromatic or fluorinated aromatic group; and

Y is a leaving group, and individually a -Cl, -Br, -I, $-NR_2$, $-N^+R_3$, -SR, $-SO_2R$, or -OR, wherein R is an alkyl, a fluorinated alkyl, aromatic or fluorinated aromatic group.

12. The process module of claim 11, wherein a bonding energy between the leaving group ("$(BE)_L$") and a core group of the precursor comprises a value less than 75 Kcal/Mole, and the range of the $(BE)_L$ comprises a range of 20 to 45 Kcal/Mole lower than a bonding energy of a next weakest chemical bond energy ("$(BE)_c$") present in the precursor.

13. The process module of claim 1, wherein the material delivery subsystem comprises:

(a) a sample container for holding the precursor;

(b) a heater to vaporize the precursor; and

(c) a feed control component to regulate the flow rate of the vaporized precursor.

14. The process module of claim 13, wherein the sample container comprises a non-corrosive material that can be heated from room temperature to 150°C; and can withstand the vacuum.

15. The process module of claim 14, wherein the non-corrosive material comprises borosilicate glass, stainless steel, or ceramic quartz.

16. The process module of claim 13, wherein the feed control component comprises a liquid mass flow controller ("LMFC") or a vapor flow controller ("VFC").

17. The process module of claim 16, wherein the LMFC delivers precursors at a rate in a range of 0.5 to 10 g/hour to a wafer.

18. The process module of claim 17, wherein the rate of precursors delivery to a 200mm wafer is in a range of 1.0 to 5 g/hour, and the rate of precursor delivery to a 300mm is in a range of 2 to 10g/hour.

19. A method for cleaning a deactivated reactor having an organic residue comprising:

oxidizing the organic residues inside the deactivated reactor; and

purging the TP reactor with a gas.

20. The method of claim 19, wherein the gas is nitrogen.